Middle East Journal of Applied Science & Technology (MEJAST)
Volume 9, Issue 3, Pages 10-17, July-September 2026

Prevalence of Self-Reported Halitosis Among Pregnant Women in Saudi Arabia - Its Impact on Oral Health-Related Quality of Life

Ghousia Sayeed[1*], Layla Ahmad Alnakhli[2] & Haifa Salman Alrobaia[2]

[1]*College of Medicine and Dentistry, Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia.*
[2]*College of Pharmacy, Nursing and Applied Sciences, Riyadh Elm University, Riyadh, Kingdom of Saudi Arabia.*
Corresponding Author (Ghousia Sayeed) Email: docghousia@gmail.com[*]

DOI: https://doi.org/10.46431/mejast.2026.9302

Copyright © 2026 Ghousia Sayeed et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Article Received: 23 May 2026 *Article Accepted: 27 July 2026* *Article Published: 05 August 2026*

ABSTRACT

Background: Halitosis is a common oral condition that may be influenced by physiological and hormonal changes during pregnancy. Despite its potential psychosocial impact, data on its prevalence and effect on oral health-related quality of life (OHRQoL) among pregnant women in Saudi Arabia are limited. **Aim:** This study aimed to determine the prevalence of self-reported halitosis among pregnant women in Saudi Arabia and evaluate its impact on OHRQoL. **Methods:** An analytical cross-sectional study was conducted among pregnant women residing in Saudi Arabia. Data were collected using a structured Arabic questionnaire covering sociodemographic and obstetric variables, self-reported halitosis, and the validated Arabic Oral Health Impact Profile (OHIP-14). Associations were tested using chi-square and independent samples t-tests, and multivariable regression models were used to identify predictors of halitosis and OHRQoL. **Results:** A total of 178 participants were analyzed, and the prevalence of self-reported halitosis was 36.8%. Participants with halitosis had significantly higher mean OHIP-14 scores than those without halitosis (19.6 ± 7.9 vs. 11.2 ± 6.5; $p < 0.001$). Lack of tongue cleaning (adjusted odds ratio [AOR] = 2.14; $p = 0.002$) and poor self-rated oral hygiene (AOR = 1.87; $p = 0.011$) were significant predictors of halitosis. **Conclusion:** Halitosis was common in this cohort and was associated with poorer OHRQoL. Integrating targeted oral hygiene counseling, especially tongue cleaning education, into antenatal care may reduce burden and improve maternal oral health outcomes.

Keywords: CoQ10; Energy Production; Nutrient; OHRQoL; Halitosis; Hormonal; OHIP-14; Hygiene; Oral; Pregnant Woman.

1.0. Introduction

Oral health is a core component of maternal well-being, and pregnancy is associated with physiological changes that increase susceptibility to oral conditions. Hormonal alterations in estrogen and progesterone modify gingival vascularity and inflammatory response, increasing risk of gingivitis, periodontal inflammation, bleeding, and salivary changes [13,14]. Current evidence indicates that oral manifestations during pregnancy, including periodontal disease, xerostomia, and plaque accumulation, are common and may predispose women to halitosis [8].

Halitosis, or oral malodor, is defined as an unpleasant oral odor beyond socially acceptable levels [2]. Most cases are intraoral and linked to anaerobic bacterial activity and volatile sulfur compound production [3,6]. During pregnancy, inflammatory gingival changes, reduced salivary flow, and oral environmental changes related to nausea and vomiting may aggravate malodor [10,11]. The clinical significance of halitosis extends beyond oral symptoms; it may impair communication, social interaction, and self-confidence and can reduce quality of life [3,4].

OHRQoL provides a multidimensional framework for quantifying functional, psychological, and social impact of oral conditions [1]. However, evidence specifically linking halitosis and OHRQoL in pregnant women remains limited, particularly in Saudi Arabia, where gaps in oral health awareness and preventive attention within women's healthcare settings have also been documented [9]. This study therefore assessed the prevalence of self-reported halitosis among pregnant women in Saudi Arabia, examined its association with selected sociodemographic and behavioral factors, and evaluated its impact on OHRQoL using the Arabic OHIP-14.

1.1. Study Objectives

1) To determine the prevalence of self-reported halitosis among pregnant women in Saudi Arabia.

2) To assess the impact of self-reported halitosis on oral health-related quality of life (OHRQoL) using the validated Arabic version of the Oral Health Impact Profile (OHIP-14).

3) To examine the association between self-reported halitosis and participants' sociodemographic, obstetric, and oral hygiene characteristics.

4) To identify independent predictors of self-reported halitosis and oral health-related quality of life among pregnant women using multivariable regression analysis.

2.0. Methodology

2.1. Study Design and Setting

This analytical cross-sectional study was conducted over three months in antenatal care settings across multiple regions of Saudi Arabia, including urban and semi-urban facilities. Recruitment occurred through public and private antenatal clinics, primary healthcare centers, and electronically distributed survey links in pregnancy support networks. The study was reported in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [15].

2.2. Participants

Eligible participants were pregnant women aged 18 years or older, residing in Saudi Arabia during data collection, able to read Arabic, and willing to provide informed consent. Women were excluded if they reported conditions that could cause extraoral halitosis (for example, uncontrolled diabetes mellitus, hepatic insufficiency, or renal disease), had taken systemic antibiotics within the preceding four weeks, were active smokers, or reported chronic respiratory infection or sinus pathology [3,6].

2.3. Sample Size Calculation

Sample size was estimated using the standard prevalence formula:

$$n = \frac{Z^2 \times P(1-P)}{e^2}$$

where n is required sample size, $Z = 1.96$ at 95% confidence, $P = 0.35$ (estimated prevalence), and $e = 0.07$ (precision).

$$n = \frac{(1.96)^2 \times 0.35(1-0.35)}{(0.07)^2} = 178.4 \approx 178$$

Accordingly, the required sample size was 178 participants, which matched the final analyzed sample.

2.4. Data Collection and Measures

Data was collected using a structured self-administered Arabic questionnaire with three domains. The first captured sociodemographic and obstetric variables, including age, education, occupation, residence, gestational trimester,

parity, and oral hygiene behaviors. The second assessed self-reported halitosis (presence, frequency, onset in relation to pregnancy, external confirmation, and help-seeking behavior). The third measured OHRQoL using the validated Arabic OHIP-14 instrument [1]. OHIP-14 includes seven domains scored on a 5-point Likert scale (0–4), with total scores from 0 to 56; higher scores indicate poorer OHRQoL.

Content validity of halitosis items was reviewed by experts in dental public health and maternal health. A pilot test ($n = 10$) evaluated clarity and reliability; pilot responses were excluded from final analyses.

2.5. Bias Control

To reduce bias, the survey used standardized wording, anonymous responses, duplicate-response restriction, and exclusion criteria targeting major non-pregnancy-related causes of halitosis. Because halitosis was self-reported, perception bias remained a recognized limitation.

2.6. Ethical Considerations

The study was approved by the Institutional Ethics Committee/Institutional Review Board of *Institutional Review Board (IRB) of Riyadh Elm University (REU)* (Approval No. *FRP/2025/593/1364/1241]*) and was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent before participation. No personally identifiable data was collected, and all records were anonymized and securely stored.

2.7. Statistical Analysis

Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized participant characteristics and halitosis prevalence. Normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Group comparisons used chi-square tests for categorical data and independent-samples t-tests for mean OHIP-14 differences. One-way ANOVA was used for trimester-based comparisons. Binary logistic regression identified predictors of halitosis, and multiple linear regression identified independent predictors of OHRQoL. Adjusted odds ratios with 95% confidence intervals were reported. Statistical significance was set at $p < 0.05$.

3.0. Results

3.1. Participant Characteristics

A total of 178 pregnant women were included in the final analysis. Sociodemographic characteristics are summarized in Table 1. Most participants were Saudi nationals and urban residents.

Table 1. Sociodemographic characteristics of participants ($N = 178$).

Characteristic	**n (%)**
Nationality: Saudi	148 (83.1)
Nationality: Non-Saudi	30 (16.9)
Age <20 years	14 (7.9)
Age 20–29 years	89 (50.0)
Age 30–39 years	62 (34.8)

Characteristic	n (%)
Age ≥40 years	13 (7.3)
Residence: Urban	134 (75.3)
Residence: Rural	44 (24.7)
Education: Elementary or less	9 (5.1)
Education: Middle/High school	44 (24.7)
Education: Bachelor	107 (60.1)
Education: Postgraduate	18 (10.1)
Occupation: Not working	100 (56.2)
Occupation: Private sector	50 (28.1)
Occupation: Government sector	28 (15.7)

3.2. Pregnancy and Oral Hygiene Characteristics

Pregnancy-related and oral hygiene variables are shown in Tables 2 and 3. Distributions were internally consistent with the sample size analyzed.

Table 2. Pregnancy characteristics ($N = 178$)

Characteristic	n (%)
Trimester: First	50 (28.1)
Trimester: Second	70 (39.3)
Trimester: Third	58 (32.6)
Previous pregnancies: None	53 (29.8)
Previous pregnancies: One	45 (25.3)
Previous pregnancies: Two	36 (20.2)
Previous pregnancies: Three or more	44 (24.7)
Morning sickness: Never	27 (15.2)
Morning sickness: Sometimes	89 (50.0)
Morning sickness: Often	44 (24.7)
Morning sickness: Daily	18 (10.1)
Acid reflux/heartburn: Yes	62 (34.8)
Acid reflux/heartburn: No	89 (50.0)
Acid reflux/heartburn: Sometimes	27 (15.2)

Table 3. Oral hygiene behaviors ($N = 178$)

Behavior	n (%)
Brushing: >2/day	27 (15.2)
Brushing: 2/day	89 (50.0)
Brushing: 1/day	45 (25.3)
Brushing: Few/week	12 (6.7)

Brushing: Rarely/Never	5 (2.8)
Flossing: Twice/day	5 (2.8)
Flossing: Once/day	27 (15.2)
Flossing: Few/week	44 (24.7)
Flossing: Rarely	71 (39.9)
Flossing: Never	31 (17.4)
Tongue cleaning: Yes	53 (29.8)
Tongue cleaning: No	80 (44.9)
Tongue cleaning: Sometimes	45 (25.3)
Mouthwash: Yes	71 (39.9)
Mouthwash: No	63 (35.4)
Mouthwash: Sometimes	44 (24.7)

3.3. Prevalence of Halitosis and OHRQoL

Overall, 36.8% of participants reported halitosis. Participants with halitosis had significantly higher mean total OHIP-14 scores than those without halitosis (19.6 ± 7.9 vs. 11.2 ± 6.5; $p < 0.001$), indicating poorer OHRQoL (Table 4).

Table 4. OHIP-14 domain scores (mean $\pm$ SD)

Domain	**Halitosis**	**No halitosis**
Functional limitation	2.0 ± 1.1	1.2 ± 0.9
Physical pain	2.3 ± 1.2	1.5 ± 0.8
Psychological discomfort	2.5 ± 1.1	1.3 ± 0.7
Physical disability	1.8 ± 0.9	1.0 ± 0.6
Psychological disability	2.2 ± 1.0	1.2 ± 0.7
Social disability	2.0 ± 1.1	1.1 ± 0.6
Handicap	1.5 ± 0.8	0.9 ± 0.5
Total OHIP-14 score	19.6 ± 7.9	11.2 ± 6.5

3.4 Predictors of Halitosis

Binary logistic regression showed that lack of tongue cleaning (AOR = 2.14; $p = 0.002$) and poor self-rated oral hygiene (AOR = 1.87; $p = 0.011$) were significant predictors of halitosis. Age, trimester, education, and parity were not independently associated with halitosis

4.0. Discussion

This study found that more than one-third of pregnant women reported halitosis, which is broadly consistent with international prevalence ranges among women [5,6]. The observed burden is clinically relevant because pregnancy-related gingival inflammation and salivary changes may increase oral malodor susceptibility [10,11]. This interpretation is further supported by recent evidence showing that periodontal-focused interventions during pregnancy can improve clinical periodontal parameters, underscoring the importance of timely preventive oral care in this population [12].

Behavioral factors were more important predictors than sociodemographic factors. Lack of tongue cleaning showed the strongest association with halitosis, supporting prior evidence that tongue coating contributes substantially to malodor generation [3]. Poor self-rated oral hygiene was also independently associated with halitosis, consistent with earlier findings on plaque control and oral malodor [7].

Participants with halitosis had significantly worse OHRQoL, particularly in psychological and social dimensions. This aligns with literature indicating that halitosis can negatively affect social confidence and emotional well-being [3,4]. Collectively, these findings support integration of oral health counseling into antenatal services and reinforce the need for interdisciplinary maternal care models involving dental and obstetric teams [13].

Key limitations include convenience sampling and self-reported halitosis, which may introduce selection and perception bias. Nevertheless, strengths include use of a validated Arabic OHIP-14 measure and multivariable modeling of behavioral and obstetric factors.

5.0. Conclusion and Future Recommendations

Self-reported halitosis was common among pregnant women in this Saudi cohort and was significantly associated with poorer OHRQoL. Lack of tongue cleaning and poor self-rated oral hygiene emerged as key predictors, while sociodemographic and trimester variables were not independently associated after adjustment.

These findings support integrating concise, behavior-focused oral health education within antenatal care, with emphasis on tongue cleaning, routine dental attendance, and early identification of women at risk of reduced OHRQoL

5.1. Future directions

1. Conduct longitudinal cohort studies: Future research should employ prospective longitudinal designs to evaluate changes in halitosis throughout pregnancy and the postpartum period, allowing assessment of temporal relationships and potential causal factors.

2. Incorporate objective diagnostic methods: Future studies should combine self-reported assessments with objective clinical measures, such as organoleptic evaluation or volatile sulfur compound (VSC) analysis, to improve the accuracy and reliability of halitosis diagnosis.

3. Investigate biological and hormonal mechanisms: Additional research is needed to explore the influence of hormonal fluctuations, salivary composition, oral microbiota, and periodontal status on the development of halitosis during pregnancy.

4. Evaluate preventive and educational interventions: Randomized controlled trials should assess the effectiveness of antenatal oral health education, tongue-cleaning practices, and preventive dental care programs in reducing halitosis and improving oral health-related quality of life.

5. Expand population diversity and geographic coverage: Multi-center studies involving larger and more diverse populations across different regions of Saudi Arabia and other countries would enhance the generalizability of findings and allow investigation of cultural and socioeconomic influences.

6. Examine broader maternal and neonatal outcomes: Future research should investigate whether maternal halitosis is associated with pregnancy-related complications, psychological well-being, healthcare utilization, and neonatal outcomes to better understand its broader clinical significance.

Declarations

Source of Funding

No internal or external funding was obtained for this study.

Competing Interests Statement

The authors declare no competing financial, professional, or personal interests.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

All the authors took part in literature review, analysis, and manuscript writing equally.

Informed Consent

All participants provided informed consent before participation. No personally identifiable data was collected, and all records were anonymized and securely stored.

Availability of data and material

The data and material are available as per the request from the corresponding author.

Institutional Review Board Statement

The study was approved by the Institutional Ethics Committee/Institutional Review Board of Institutional Review Board (IRB) of Riyadh Elm University (REU) (Approval No. FRP/2025/593/1364/1241]) and was conducted in accordance with the Declaration of Helsinki.

Ethical Approval

The study was approved by the Institutional Ethics Committee/Institutional Review Board of Institutional Review Board (IRB) of Riyadh Elm University (REU)

Acknowledgement

The authors would like to thank all the people who are directly or indirectly related to this study for their support and concern.

References

[1] Al-Jundi, M.A., Szentpetery, A., & John, M.T. (2007). An Arabic version of the Oral Health Impact Profile: Translation and psychometric properties. International Dental Journal, 57(2): 84–92. https://doi.org/10.1111/j.1875-595x.2007.tb00443.x.

[2] Attia, E.L., & Marshall, K.G. (1982). Halitosis. Canadian Medical Association Journal, 126(11): 1281–1285.

[3] Aylikci, B., & Colak, H. (2013). Halitosis: From diagnosis to management. Journal of Natural Science, Biology and Medicine, 4(1): 14–23. https://doi.org/10.4103/0976-9668.107255.

[4] Fakheran, O., Keyvanara, M., Saied-Moallemi, Z., & Khademi, A. (2020). The impact of pregnancy on women's oral health-related quality of life: A qualitative investigation. BMC Oral Health, 20(1): 294. https://doi.org/10.1186/s12903-020-01290-5.

[5] Hasan, M., Afrin, S., & Chowdhury, N.U. (2019). Female are more prone to halitosis due to the changing of the hormonal balance: A cross-sectional study in Bangladesh. American Journal of Biomedical Science & Research, 3(2): 106–110.

[6] Memon, M.A., Memon, H.A., Muhammad, F.E., et al. (2023). Aetiology and associations of halitosis: A systematic review. Oral Diseases, 29: 1432–1438. https://doi.org/10.1111/odi.14172.

[7] Mumghamba, E., Manji, K., & Michael, J. (2007). Oral hygiene practices, periodontal conditions, dentition status and self-reported bad mouth breath among young mothers, Tanzania. International Journal of Dental Hygiene, 4(4): 166–173. https://doi.org/10.1111/j.1601-5037.2006.00186.x.

[8] Pecci-Lloret, M.P., et al. (2024). Oral manifestations in pregnant women: A systematic review. Journal of Clinical Medicine, 13(3): 707. https://doi.org/10.3390/jcm13030707.

[9] Rahman, G., Asa'ad, F., & Baseer, M.A. (2015). Periodontal health awareness among gynecologists in Riyadh, Saudi Arabia. Journal of International Society of Preventive & Community Dentistry, 5: 211–217. https://doi.org/10.4103/2231-0762.159959.

[10] Rankouhi Elmi, Z., Kia, S.J., Maleki, D., & Masoumi, M. (2019). Comparison of intra-oral manifestations of pregnant and non-pregnant women: An observational case-control study. Journal of Dentomaxillofacial Radiology, Pathology and Surgery, 8(3): 34–38. https://doi.org/10.52547/3dj.8.3.34.

[11] Rezvi, F.B., Duraisamy, R., & Chaudhary, M. (2020). Oral status of pregnant women: A hospital-based study. International Journal of Dentistry and Oral Science, 7(10): 881–887. https://doi.org/10.19070/2377-8075-20000175.

[12] Sayeed, G., & Varghese, S.S. (2024). Evaluation of the effect of supragingival scaling on periodontal parameters in pregnant women with metabolic syndrome. Journal of Pharmacy and Bioallied Sciences, 16(4): s3925–s3931. https://doi.org/10.4103/jpbs.jpbs_1372_24.

[13] Steinberg, B.J., Hilton, I.V., Iida, H., & Samelson, R. (2013). Oral health and dental care during pregnancy. Dental Clinics of North America, 57(2): 195–210. https://doi.org/10.1016/j.cden.2013.01.002.

[14] Thakur, V., Thakur, R., Kaur, M., et al. (2020). Pregnancy and oral health and dental management in pregnant patient. Journal of Current Medical Research and Opinion, 3(11). https://doi.org/10.15520/jcmro.v3i11.360.

[15] von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gotzsche, P.C., & Vandenbroucke, J.P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. PLoS Medicine, 4(10): e296. https://doi.org/10.1371/journal.pmed.0040296.